Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	GN Docket No. 18-122
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	RM-11791
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service	RM-11778

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Google applauds the Commission's efforts to open the 3.7–4.2 GHz band (C-band) for more intensive terrestrial use.[1] With 500 MHz of bandwidth, the C-band represents an unparalleled opportunity to bring 5G fixed point-to-multipoint (P2MP) services rapidly to Americans, particularly those in traditionally underserved areas. 5G P2MP deployments are "shovel-ready." Service could begin almost immediately when the rule changes take effect, would not require clearing of fixed-satellite service (FSS) earth or space stations, and would not disrupt FSS operations in the band.

[1] *See In the Matter of Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, GN Docket No. 18-122, FCC 18-91 (rel. July 13, 2018) (*NPRM*).

In addition to rapid deployment of 5G P2MP services, opportunities exist to deploy mobile broadband under a flexible use designation, subject to clearing FSS earth and space station operations. While introducing mobile broadband will be significantly more challenging, time-consuming, and expensive than 5G P2MP use, the potential long-term benefits are worth the effort.

Relying on a private Transition Facilitator to clear C-band spectrum for mobile uses raises concerns, however. Incumbent FSS operators and mobile carriers have incentives that may be inconsistent with the public interest in maximizing the availability of spectrum for terrestrial use. To the extent that a private Transition Facilitator is used at all, protections should be implemented to ensure a fair and unbiased process.

Finally, before new 5G fixed or mobile broadband can be deployed in the C-band, complete and accurate information on current FSS use must be collected and publicly disseminated. This will allow industry to assess sharing opportunities accurately from both technical and business perspectives. With minor modifications, the Commission's proposed data collection for operational C-band earth stations[2] will provide a suitable framework for these assessments. The Commission additionally should confirm that the data in newly submitted registrations are accurate so that stakeholders can reliably gauge opportunities for use of C-band spectrum.

[2] *Id.* ¶ 41.

I. MORE INTENSIVE FIXED USE OF THE C-BAND CAN OCCUR IMMEDIATELY WITHOUT HARM TO SATELLITE INCUMBENTS OR FUTURE MOBILE ENTRY

Google commends the Commission for investigating opportunities to expand point-to-point (P2P) and P2MP fixed broadband service (collectively, "fixed service") in the C-band. With the right policies, major wireless carriers, as well as Wireless Internet Service Providers and other rural operators, can establish last-mile and backhaul links that will bring 5G wireless broadband to tens of millions of Americans in rural areas, and allow service providers to avoid costly wiring or rewiring of urban and suburban buildings.[3]

FSS receive-only earth stations use the C-band to distribute broadcast and cable TV programming, among other content. The locations of these earth stations may be included in the Commission's International Bureau Filing System (IBFS), but registration is not mandatory because the stations do not transmit. The C-band also is allocated for fixed service use on a co-primary basis with rules that favor traditional, long-haul P2P links. Difficulties of coordinating these fixed service links with FSS incumbents have severely limited fixed use of the band, however.[4]

IBFS data make automated coordination with incumbent receive-only earth stations readily achievable. Using IBFS data, interference analysis can account for a

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[3] *See, e.g.,* Verizon, *Verizon Turns on World's First 5G Network*, Oct. 1, 2018, at https://www.verizon.com/about/news/verizon-turns-worlds-first-5g-network; Letter from Nancy J. Victory, DLA Piper LLP, Counsel for T-Mobile US, Inc., to Marlene H. Dortch, Secretary, FCC, in WT Docket No. 18-197, at Appendix B, ¶ 76 (filed June 18, 2018).
[4] *See* Comments of Google LLC and Alphabet Access in GN Docket No. 17-183 at 4 (filed Oct. 2, 2017) (*Oct. 2017 Comments*).

new fixed wireless broadband system's proposed location, beam pattern, combined interference power with other systems in the surrounding area, and transmitted frequency and bandwidth.[5] An updated and corrected IBFS that provides complete and accurate information therefore will provide the tools needed to expand fixed broadband use of C-band spectrum rapidly.

About half of FSS sites are in urban areas, and the rest are in suburban and rural areas.[6] Suburban and especially rural areas have large land areas and therefore a low concentration of FSS sites overall. Thus, throughout much of the country and particularly in rural areas, more than adequate space will be available to accommodate fixed broadband systems while protecting FSS stations.

Although there will be some lead time before mobile and other flexible uses can be introduced in the C-band, fixed services can immediately coexist with FSS operations. FSS service can continue uninterrupted as fixed services capable of providing gigabit-class broadband service to American homes and businesses are introduced.

A. Changes to the Part 101 Rules Are Necessary To Accelerate Fixed Service Deployment

The Commission should proceed with plans to modernize Part 101 of its Rules to accelerate deployment of new fixed service systems while maintaining an environment conducive to future flexible use.[7] The following changes to Part 101 would enable a

[5] *See* Comments of Google LLC in GN Docket No. 18-122 at 4 (filed May 31, 2018) (*May 2018 Comments*).
[6] *See Oct. 2017 Comments* at 6.
[7] *See NPRM* ¶¶ 116-132.

greater diversity of terrestrial deployments, while still protecting FSS incumbents (as well as the very limited long-haul microwave use that exists today) and retaining the ability to clear part of the 3.7–4.2 GHz band for flexible use.

Channel Plan. As the Commission notes, P2P fixed service licensees in the C-band currently may be assigned 20 MHz paired channels for common carrier or private links.[8] The Commission should modify Rule 101.147(h) to accommodate time division duplex channels and channel aggregation to expand link capacity.[9] For common carrier fixed microwave services, moreover, only P2P links are authorized, making registration of broadband networks on a link-by-link basis cumbersome and costly.[10] P2MP links should be listed as authorized services in Rule 101.101.[11]

Frequency Coordination and Interference Protection. Changes to the frequency coordination processes set forth in Rule 101.103 could encourage greater use of C-band spectrum. Requiring in Rule 101.103 that fixed service devices be capable of operating across the full 500 MHz of the 3.7–4.2 GHz band would ensure easy adaptation to future frequency plans or band allocations. For instance, new rule language could provide that "Stations that operate on any portion of the frequencies within the 3700–4200 MHz band must be capable of operating on all frequencies within

[8] *See id.* ¶ 117.
[9] *See* Comments of Google Fiber Inc. in RM-11778 at 8 (Jan. 9, 2017) (*Jan. 2017 Comments*).
[10] *See id*.
[11] *NPRM* ¶ 119.

that band."[12] Existing equipment not already operable across the band could be provided a reasonable transition period to come into compliance.[13]

The Commission also should streamline the outdated license assignment and frequency coordination processes in Rule 101.103(d) to accommodate faster entry by more C-band users. For instance, in place of "snail mail" coordination, automated systems employing industry-specified interference criteria and propagation models could support rapid notification, coordination, and authorization.[14] Coordination between fixed broadband systems and FSS earth stations is particularly amenable to automated coordination, because the locations and other characteristics of these systems are known and, unlike mobile and portable devices, do not often change. Compared to the decades-old coordination process currently reflected in Part 101, an automated system would benefit from modern computing systems' ability to provide realistic propagation predictions and speed coordination calculations to just milliseconds.[15]

In addition, the location accuracy requirements specified in Rule 101.103(d)(2)(ii) should be updated to reflect 5G use cases.[16] Fixed device location requirements should be 50 m horizontal and 3 m vertical (consistent with, for example, the E911 rules for horizontal accuracy and the Citizens Broadband Radio Service (CBRS) rules for horizontal and vertical accuracy).[17] This approach is superior to the current 1 arc second

[12] *See* Reply Comments of Google LLC and Alphabet Access in GN Docket No. 17-183 at 7 (filed Nov. 15, 2017) (*Nov. 2017 Reply Comments*).
[13] *Id.* at 8.
[14] *See Jan. 2017 Comments* at 8-9; *NPRM* ¶ 124.
[15] *See Oct. 2017 Comments* at 10-11.
[16] *See Jan. 2017 Comments* at 8.
[17] *See* 47 C.F.R. §§ 20.18(i)(2)(i); 96.39(a).

(approximately 30 m) horizontal and 1 m vertical accuracy requirement, which is based on major long-haul fixed systems professionally installed on large towers.[18] The more practical standard would simplify deployment without materially altering the risk of harmful interference, because location uncertainty can be accounted for in coordination. Further, the Commission should modernize antenna performance and out-of-band emissions requirements to better reflect the reduced interference potential of shorter-range P2P and P2MP systems compared to that of long-haul microwave systems installed on tall towers and mountaintops.[19]

Other Reforms. Additional changes to Part 101 technical requirements would expand opportunities for 5G use of C-band spectrum.

- Existing fixed service rules provide power limits based on link length. The maximum EIRP formula in Rule 101.143(b) favors long-haul connections and severely constrains low-power, short-haul links vital to wireless broadband. As the Commission explains, P2MP systems will have individual links between access points and client devices that vary in length.[20] Regulatory power limits should be modified to make shorter-range services viable on a non-interfering basis.[21] As Google has noted, low-power, last-mile broadband distribution could be enabled by using P2P/P2MP connections with approximately 1 to 50 Watts EIRP.[22]

- Rule 101.115 specifies the maximum beamwidth, minimum antenna gain and radiation suppression envelope for fixed service antennas in this band. This rule should be modified to include updated antenna performance specifications that allow for broader beamwidth and lower gain consistent with 5G uses, as opposed to long-haul links.

- The Commission recognizes that the "minimum traffic loading payload requirement in Section 101.141(a)(3)(ii) was designed for symmetrical traffic and

[18] *See id*. § 101.103(d)(2)(ii).
[19] *See Jan. 2017 Comments* at 8.
[20] *NPRM* ¶ 125.
[21] *See Jan. 2017 Comments* at 8.
[22] *See May 2018 Comments* at 6.

that IP traffic is often asymmetrical."[23] Broadband traffic, moreover, generally peaks during the day and evening. In recognition of such traffic fluctuations, band utilization rules that stipulate that traffic loading payload must be maintained at above 50% should be removed.[24]

- Rule 101.131(a) requires that equipment at the operating and transmitting positions must be installed and protected so that "it is not accessible to, or capable of being operated by, persons other than those duly authorized by the licensee." As the Commission anticipates, client devices using the 3.7–4.2 GHz band could be mounted to "provide a good connection back to the access point, free from obstructions within the transmission path" in a way that "may not strictly comply with the access restriction requirement."[25] Numerous other potential use cases, including wireless routers or other types of consumer devices, may "require separate consideration for the purposes of equipment authorization and RF exposure compliance."[26] To offer providers more flexibility when introducing services, restrictions in Rule 101.131(a) on third-party access to network equipment should be relaxed.[27]

Enactment of these regulatory changes to Part 101, combined with an updated and accurate IBFS, would allow for efficient coordination of P2MP operations with FSS and long-haul fixed uses in the C-band. Exact locations and characteristics of incumbent stations would be known, recorded, and rarely changed. With known FSS frequency use parameters, frequency separation could facilitate P2MP broadband connectivity to as many as 120 million Americans.[28]

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[23] *NPRM* ¶ 130.
[24] *See Jan. 2017 Comments* at 8; *May 2018 Comments* at 9.
[25] *NPRM* ¶ 131.
[26] *Id.*
[27] *See Jan. 2017 Comments* at 8.
[28] *See* Letter from Stephen E. Coran, Counsel for the Wireless Internet Service Providers Association, to Marlene H. Dortch, Secretary, FCC, in GN Docket No. 17-183, Attachment 2 at 42 (filed Mar. 29, 2018).

B. Fixed Broadband Deployments Will Not Impede Partial Band Clearing for Flexible Use

As the Commission proposes, new flexible use licensees in the 3.7–4.2 GHz band should operate in the lower segment of the band (starting at 3.7 GHz).[29] Assuming successful clearing of FSS incumbents, expeditious deployment of more flexible use spectrum in the lower segment of the band that is "contiguous to the spectrum for which flexible use is already licensed" would be "relatively easy and cost-effective."[30] As in the adjacent CBRS band, database management techniques, relatively low transmit power limits, and band-wide operability requirements can be quickly employed to unleash C-band spectrum for high-capacity fixed wireless or capacity-enhancing mobile access points. And like CBRS, frequency agile fixed broadband systems governed by an automated Part 101 geolocation database could accommodate future use of a portion of the band by mobile operators.

Immediately permitting P2P and P2MP operations across the 3.7–4.2 GHz band would be consistent with any such plan for future mobile entry. Google has demonstrated that sharing between fixed broadband deployments and FSS earth stations can be accommodated in a variety of ways, on either a co-channel or non-co-channel basis. In the co-channel case, frequency separation between FSS and fixed broadband is not necessary. Instead, fixed deployments protect FSS earth stations either by separation distance (i.e., a fixed deployment is not located near any earth stations) or by directional separation (i.e., designing a fixed broadband deployment so

[29] *NPRM* ¶ 119.
[30] *Id.*

that the earth station is not within the beam of either the base station or any remote stations served by the base station). Because FSS earth station locations could be known before designing a fixed broadband network, both geographic and directional separation would be effective, long-term solutions to sharing C-band spectrum if new FSS deployments are prohibited in the C-band, as proposed in the NPRM[31] and supported by Google. Further, repacking of FSS earth stations precipitated by clearing spectrum for flexible use at the bottom of the band would not preclude co-existence, because both geographic and directional separation can allow co-channel sharing.

Fixed broadband deployments would have additional freedom when not attempting to share the same frequency range as a nearby earth station, because only the broadband system's out-of-band emissions or the earth station's out-of-band filter response must be considered. Under these circumstances, broadband systems could radiate higher power in the earth station's direction without causing harmful interference, compared to the co-channel case. Even though broadband networks would generally not rely on these out-of-band situations exclusively, such cases would be opportunistic and complementary to co-channel sharing.

Thus, there is no inconsistency between allowing expanded P2P and P2MP use of the entire 3.7–4.2 GHz band now, and enabling mobile use of a portion of the band later. That said, there should be some assurance that investments in fixed broadband systems will be recoverable in the long run. Regardless of the amount of spectrum that

[31] *Id.* ¶ 30 (proposing to revise Part 25 rules to "permanently limit eligibility to file applications for earth station licenses or registrations to incumbent earth stations").

becomes available for full flexible use, therefore, the Commission should ensure the long-term availability of at least 200 MHz from the top of the band (e.g., at least the range from 4.0 to 4.2 GHz) for licensed P2P and P2MP services.

II. AN AUCTION MECHANISM WILL PROMOTE THE MOST EFFICIENT FLEXIBLE USE OF THE 3.7–4.2 GHZ BAND IN FURTHERANCE OF THE PUBLIC INTEREST

The NPRM presents a variety of approaches to effectuate clearing C-band spectrum for flexible use, all of which merit full and thoughtful consideration.[32] One option—a Commission-administered auction mechanism—stands out for its history of success. Specifically, an auction offers a tested "market-based means of repurposing much-needed spectrum for flexible use," including for mobile services.[33] By contrast, another option featuring prominently in the NPRM—incumbent FSS operators acting as a Transition Facilitator—is similar to approaches that have been less successful in the past, and raises band-specific concerns as well. Many difficult issues would require resolution prior to placing responsibility for clearing C-band spectrum into non-governmental hands.

Most obviously, tensions may exist between using a private Transition Facilitator to clear C-band spectrum and the Commission's "obligation to assign spectrum in the public interest."[34] A process that relies on a private Transition Facilitator may not yield "the most economically efficient allocation of the band between services" or take into

[32] *Id.* ¶ 58.
[33] *See* FCC, *Incentive Auctions FAQs,* at https://www.fcc.gov/general/incentive-auctions-faqs (last visited Oct. 29, 2018).
[34] *NPRM* ¶ 86.

account other important public interest goals.[35] The personal and professional interests of corporate leaders in maintaining existing FSS services could figure prominently—and possibly negatively—in determining how much spectrum to clear. As the Commission suggests, "allowing all potential sellers to agree on the amount and price of the spectrum that will be repurposed" could "result in a situation in which those sellers offer a lower quantity than is socially efficient."[36]

Unlike a Commission auction, moreover, revenues generated from private industry negotiations will not return funds to the U.S. Treasury. FSS incumbents, including non-U.S. operators that acquired their C-band rights from the Commission at no cost, would reap a financial windfall. As Commissioner O'Rielly recently noted in the context of the CBRS proceeding, "spectrum belongs to the people and ... it is the Commission's obligation to manage it in the public interest for *all* Americans."[37] The fastest path to reallocating spectrum may not be the best path, if speed comes at a significant cost to spectrum availability, future competition, and the federal budget.

Consideration also must be given to how broadcast and cable businesses can transition away from their reliance on C-band delivery.[38] Efficient allocation of spectrum requires, among many other considerations, balancing the social value of these

[35] *Id.* ¶ 57.
[36] *Id.* ¶ 71.
[37] Statement of Comm'r Michael O'Rielly, *Promoting Investment in the 3550-3700 MHz Band*, GN Docket No. 17-258 (Oct 24, 2018).
[38] *Id.* at Appendix B, ¶ 4 ("Predominant GSO FSS uses include delivery of programming content to television and radio broadcasters, including transportable antennas used to cover live news and sports events, cable television and small master antenna systems, as well as the backhaul of telephone and data traffic").

services "against the social value of alternative services that could be provided by that spectrum, such as mobile data."[39] Negotiations between FSS operators and mobile carriers would not necessarily reflect the important externalities of their agreements, whereas Commission action to design an auction framework could take the needs of all stakeholders in account.

An incumbent-determined transition also might yield a "patchwork quilt of spectrum [that] would draw no meaningful investment in the band for wireless mobile broadband use."[40] This would be unfortunate because the C-band could potentially "supply multiple 100-megahertz channel blocks required for 5G."[41] A Transition Facilitator representing international satellite businesses would have little if any concern for the long-term development of 5G services in the United States and maintaining this country's global leadership in wireless, which should be of paramount concern to the Commission. Making substantial spectrum resources available is key to maximizing public interest benefits from the C-band, yet the Transition Facilitator proposal provides little assurance of achieving this end.

Furthermore, reliance on private parties to oversee the process of transitioning spectrum resources is inherently risky. The Commission is painfully familiar with the 800 MHz rebanding effort. There, "Sprint, as the largest commercial spectrum holder in the [800 MHz] band, agreed to undertake" the role of Transition Administrator so that

[39] *Id.* ¶ 63.
[40] *See* Reply Comments of T-Mobile USA, Inc. in GN Docket No. 17-183 at 13 (filed Nov. 15, 2017).
[41] *See* Comments of CTIA in GN Docket No. 18-122 at 3 (filed May 31, 2018).

"interference problems that had enmeshed 800 MHz incumbents in increasingly ineffective *ad hoc* solutions, could be resolved on a more long-term basis."[42] The 800 MHz rebanding commenced on June 27, 2005, with a planned duration of 36 months.[43] More than a dozen years later, the effort is still ongoing[44] with Sprint's "creditable expenses in connection with the rebanding initiative" exceeding $2.8 billion.[45] In the same way, a significant likelihood exists that unforeseen delays would slow the process of clearing C-band spectrum through a Transition Facilitator approach. By contrast, the FCC's extensive experience with spectrum auctions and reallocations would reduce the risk of an FCC-managed transition.

If the Commission does pursue a market-based mechanism despite these concerns, preventing collusion between buyers and sellers of C-band spectrum is imperative. Ahead of its first spectrum auction more than two decades ago, the Commission acted to deter collusion in competitive bidding.[46] Commission rules prohibit cooperation or collaboration on the substance of "bids or bidding strategies (including

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[42] *In the Matter of Improving Public Safety Communications in the 800 MHz Band*, Declaratory Ruling, 32 FCC Rcd. 7528, ¶ 2 (2017) (*800 MHz Declaratory Ruling*) (emphasis in original).
[43] *Wireless Telecomms. Bureau Announces That 800 MHz Band Reconfiguration Will Commence June 27, 2005, in the NPSPAC Regions Assigned To Wave 1 and Specifies 800 MHz Reconfiguration Benchmark Compliance Dates,* Public Notice, 20 FCC Rcd. 9961 (2005).
[44] *See* Public Notice, *Pub. Safety and Homeland Security Bureau Provides Guidance to Canada Border Reg'l Planning Comms. on Amending Their 800 MHz Reg'l Plans to Reflect Band Reconfiguration,* WT Docket No. 02-55, DA 18-866 (rel. Aug. 21, 2018).
[45] *800 MHz Declaratory Ruling* ¶ 1.
[46] *See In the Matter of Implementation of Section 309(j) of the Commc'ns Act - Competitive Bidding*, Second Report and Order, 9 FCC Rcd. 2348, ¶¶ 221-226 (1994).

post-auction market structure)" or settlement agreements.[47] Similar protections should be extended to any process led by a Transition Facilitator.

Overlay licenses are an approach that deserves attention as an alternative to either a conventional FCC auction or a private auction. While allowing immediate fixed broadband use upon revision of the Part 101 rules, the Commission also could accept applications for one or more flexible-use overlay licenses, assigned by competitive bidding if mutually exclusive applications are submitted. This would permit an overlay licensee to negotiate with both incumbent space station licensees and earth station owners and operators to clear all or part of the auctioned frequency range. As the Commission notes, the "overlay license approach potentially would allow non-incumbent bidders to develop innovative ways to clear the spectrum and clear more spectrum or varying amounts of spectrum depending on the relative costs and benefits of such repurposing."[48] Unlike the proposed Transition Facilitator methodology, the overlay licensing approach has been used successfully in the past to transition bands from site-based to geographic-area licensing.[49]

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[47] *See* 47 C.F.R. § 1.2105(c)(1).
[48] *NPRM* ¶ 101.
[49] *Id.* n.144 (citing *In the Matter of Amendment of Part 90 of the Comm'n's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service*, Third Report and Order and Fifth Notice of Proposed Rulemaking, 12 FCC Rcd. 10943 (1997); *In the Matter of Revision of Part 22 and Part 90 of the Comm'n's Rules to Facilitate Future Development of Paging Systems*, Second Report and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd. 2732 (1997); *In the Matter of Amendment of Part 90 of the Comm'n's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, First Report and Order; Eighth Report and Order; Second Further Notice of Proposed Rulemaking, 11 FCC Rcd. 1463 (1995)).

III. INFORMATION ABOUT FSS USE OF THE C-BAND IS NECESSARY TO MAXIMIZE EFFICIENT UTILIZATION BY OTHER SERVICES

Having a "clear understanding of the operations of current users" is fundamental to *any* decision about the C-band, "including the scope of future FSS, [fixed service], and potential mobile use of the band and the appropriate transition methodology."[50] As the Commission acknowledges, however, "information regarding current use of the band is inaccurate and/or incomplete."[51] This has led to a multi-tiered effort to gather robust and accurate information about FSS use of the C-band. First, the Commission directed C-band earth station operators to certify the accuracy of their data in IBFS.[52] Second, the Commission directed operators of temporary fixed or transportable earth stations to submit additional information about their operations.[53] Third, the Commission issued a Public Notice allowing registration of previously unregistered earth stations that were operational as of April 19, 2018.[54] Finally, the Commission proposed requiring that C-band earth station operators provide additional information on their operations.[55]

Even though opening the C-band is an urgent matter that should receive highest priority, no action can be taken without the completion of all four of these important steps. As Google previously explained, approximately 29% of C-band earth station

[50] *NPRM* ¶ 16.
[51] *Id.*
[52] *Id.* ¶ 19.
[53] *Id.* ¶ 20.
[54] *See* Public Notice, *Temp. Freeze on Applications for New or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band, 90-Day Window to File Applications for Earth Stations Currently Operating in the 3.7-4.2 GHz Band*, GN Docket Nos. 17-183 and 18-122, DA 18-398 (rel. Apr. 19, 2018).
[55] *NPRM* ¶ 41.

registrations in 2017 were inaccurate.[56] Analysis of areas in which shared use can be accommodated requires a full and detailed picture of the earth station landscape. Having more granular data available, particularly the specific frequency ranges over which registered earth stations operate and the actual antenna patterns of the earth station dishes, will greatly improve analytical accuracy.

Among other data, the Commission has proposed requiring operators to submit "transponder number(s) and how often each transponder is used."[57] It is not clear whether a "transponder number" adequately specifies the frequency range that an earth station operator could be using. The NPRM refers to a definition last used in 2014,[58] which states that "[d]ownlink analog video transmissions in the band 3700–4200 MHz shall be transmitted only on a center frequency of 3700 + 20N MHz, where N = 1 to 24...."[59] However, this definition only specifies the center frequency, and not the frequency range. The standard transponder is 36 MHz wide,[60] so by this definition, fragmented bits of the C-band could never be specified as "in use" by earth station operators if they only provide transponder numbers. For example, 3700–3702, 3738–3742, and 3778–3882 MHz could never be declared in use, leaving orphaned 2- and 4-MHz segments scattered throughout the band, yet generally not useful for broadband applications. Furthermore, "transponder numbers" have no meaning for non-FSS services that may share the band; rather, the frequency range—which should

[56] *Oct. 2017 Comments* at 4.
[57] *NPRM* ¶ 41.
[58] *Id.* n.58.
[59] 47 C.F.R. § 25.211(a) (2014).
[60] *NPRM*, n.58.

be known to the earth station operator—is the important criterion. For these reasons, the Commission should require registration of the frequency ranges in use by each earth station, rather than transponder numbers.

Google is currently analyzing the large volume of newly submitted earth station registration data. As of the filing of these comments, the majority of such registrations are still pending acceptance by the Commission, and new registrations continue to be submitted.[61] We understand that the processing of these filings could take several weeks or months after the final deadline for registration. Full analysis of the viability of fixed service and flexible use sharing could only be done after Commission processing is complete. Detailed analysis of sharing (and clearing) opportunities also depends on the collection of the more detailed data proposed in the NPRM.[62] Given these interdependencies, the Commission should act to expedite this data collection to the greatest extent possible, and thereby allow industry to move forward with planning for 5G deployments.

IV. CONCLUSION

Google applauds the Commission for taking steps to open the C-band for more intensive terrestrial use. 5G fixed service could begin almost immediately, without disrupting FSS operations. Opportunities also exist to deploy mobile broadband under a flexible use designation, subject to clearing FSS earth and space station operations.

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[61] *See* Public Notice, *Int'l Bureau Announces Two-Week Extension of Filing Window for Earth Stations Currently Operating in 3.7-4.2 GHz Band*, GN Docket No. 18-122, DA 18-1061 (rel. Oct. 17, 2018) (announcing extension, through October 31, 2018, to the filing window for FSS earth stations currently operating in the 3.7–4.2 GHz band).
[62] *NPRM* ¶¶ 41-45.

The Commission should exercise caution in considering whether to rely on a private Transition Facilitator to clear C-band spectrum. To the extent that a private Transition Facilitator is used at all, protections should be implemented to ensure a fair and unbiased process. Finally, before either 5G fixed or mobile broadband can be deployed in the C-band, complete and accurate information on current FSS use must be collected and made available to allow industry to accurately assess sharing opportunities.

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